HONOLULU
LA JOLLA
MONTEREY
TIBURON

SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - JUNE 1984

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Deputy Director ..... *John F. Carr*
Planning Officer ..... *David J. Mackett*
Data Systems Manager ..... *Fred J. Kellenberger*
Executive Officer ..... *Benjamin F. Remington*

LABORATORIES & DIVISIONS

Coastal Fisheries Resources Division, Chief ..... *Reuben Lasker*
La Jolla, California
Honolulu Laboratory, Director ..... *Richard S. Shomura*
Honolulu, Hawaii
Oceanic Fisheries Resources Division, Chief ..... *Gary T. Sakagawa*
La Jolla, California
Pacific Environmental Group, Chief ..... *Andrew Bakun*
Monterey, California
Tiburon Laboratory, Director ..... *Norman J. Abramson*
Tiburon, California

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SOUTHWEST FISHERIES CENTER
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Status of Publications

Published

Alvarino, Angeles and J.M. Wojtan. 1984. Three new species of Lensia, and description of the eudoxia stages of Lensia reticulata and Lensia lelouveteau (Calycophorae:Siphonophorae). Proc. Biol. Soc. Wash. 97(1):49-59.

Three new species of lensia are described and illustrated: Lensia eugenioi, L. eltanin, and L. landrumae, their diagnostic characteristics are discussed and compared with those of other closely related species of Lensia. The previously unknown eudoxid stages of Lensia reticulata Totton, 1954, and L. lelouveteau Totton, 1941, are also described and illustrated. The specimens were observed in plankton collections obtained during the U.S. Antarctic Research Program.

Balazs, George H. 1984. Sea turtles and their traditional usage in Tokelau. Atoll Res. Bull. 279:1-30.

The conservation status, ecology, and cultural importance of sea turtles at the three Polynesian atolls of Tokelau are presented. The green turtle, Chelonia mydas, is the most common species, occurring as a migrant breeder mostly during September through November. The hawksbill, Ertmochelys imbricata, is present in small numbers at all three atolls, but nesting is only known at Nukunonu Atoll. A third species, the loggerhead, Caretta caretta, has also been recorded on rare occasions. In Tokelau, sea turtles are considered "sacred fish" (ika ha) that must be shared among the entire village by an equitable system known as inati. The number of sea turtles has declined within historical times apparently as a result of modern and more efficient hunting methods. A main objective of this research is to help the Tokelauans effectively manage sea turtles so that these animals can continue to be part of the native diet and culture. Based on this study's findings, 11 recommendations for conservation are offered that either build upon, or reinforce, existing traditional practices. These conervation measures may also be applicable to sea turtle populations used by other insular people of the Pacific.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

Brill, Richard W., Kim N. Holland, and J. Scott Ferguson. 1984. Use of ultrasonic telemetry to determine the short-term movements and residence times of tunas around fish aggregating devices. Proceedings of the Pacific Congress on Marine Technology, PACON 84, April 24-27, 1984, Honolulu, Hawaii, p. MRM1/1-7.

Sherman, Kenneth, R. Lasker, W. Richards, and A.W. Kendall, Jr. 1983. Ichthyoplankton and fish recruitment studies in large marine ecosystems. Marine Fisheries Review. Oct.-Nov.-Dec., 45(10-11-12): 1-25.

Within the Fishery Management Zone of the United States, seven Large Marine Ecosystems (LME's)--Insular Pacific, Eastern Bering Sea, Gulf of Alaska, California Current, Gulf of Mexico, Southeast Atlantic Shelf, and Northeast Atlantic Shelf--support multi-billion-dollar fisheries, operating at different trophic levels. The LME's are characterized by unique bathymetry, hydrography, productivity, and population structure. To improve abundance forecasts of recruitment success of incoming year-classes, two assessment strategies are used by NMFS in the LME's: 1) Fisheries independent surveys of fish eggs and larvae on mesoscale grids of 20-100 km at frequencies of two to twelve times a year to obtain estimates of the size of the spawning adult stocks, and 2) other studies within the mesoscale survey matrix aimed at discovering the processes controlling the annual recruitment success of new year-classes. Processes under investigation included growth and mortality of eggs and larvae under variable density-dependent predator-prey interactions and density-independent influences of changes in circulation, water-column structure, biological production, and pollution. The sampling designs of the multispecies ichthyoplankton surveys in the LME's provide measures of spatial and temporal variability within acceptable confidence limits for estimating changes in abundance levels of spawning stock sizes off the northeast coast and in the California Current areas.

Walker, Michael M., Joseph L. Kirschvink, Shih-Bin R. Chang, and Andrew E. Dizon. 1984. A candidate magnetic sense organ in the yellowfin tuna, Thunnus albacares. Science (Wash., DC) 224:751-753.

Single-domain magnetite crystals have been isolated and characterized from tissue located in a sinus within the dermethmoid bone of the skull of the yellowfin tuna, Thunnus albacares. Their chemical composition, narrow size distribution, and distinctive crystal morphology indicate that these crystals are biochemical precipitates. Experiments on the interaction between particles reveal the organization of the particles in situ and suggest a possible form for candidate magnetoreceptor organelles. The consistent localization of such particles with

similar arrangement within the dermethmoids of this and other pelagic fishes suggests that the ethmoid region is a possible location for a vertebrate magnetic sense organ.

Approved by Center Director

Balazs, George H. Evidence for the retention of flipper tags on hatchling sea turtles. J. Herpetol.

Barlow, Jay. Variability, trends and biases in reproductive rates of spotted dolphins (Stenella attenuata). For consideration for publications in Fishery Bulletin, U.S.

Barlow, Jay. Biological limits on current growth rate of a spotted dolphin population (Stenella attenuata). For consideration for publication in Marine Mammal Science.

Herrick, Samuel F., Jr., and S[illegible]en J. Koplin. 1983 U.S. tuna trade survey. For consideration for publication in Marine Fisheries Review.

Hohn, Aleta A., Susan J. Chivers, and Jay Barlow. Reproductive maturity and seasonality in male spotted dolphins, Stenella attenuata, in the eastern tropical Pacific. For consideration for publication in Marine Mammal Science.

Ratty, F.J., Y.C. Song, and R.M. Laurs. Chromosomal analysis of albacore, yellowfin and skipjack tuna. For consideration for publication in Fishery Bulletin, U.S.

Laurs, R.M., R. Nishimoto, and J.A. Wetherall. Frequency of ring formation on sagittae of North Pacific albacore, Thunnus alalunga. For consideration for publication in Nature.

Translation

Bito, Masamichi. 1983. Burnt tuna (Maguro no yake niku). Sakana, Tokai Reg. Fish. Res. Lab. 31:56. (Engl. transl. by Tamio Otsu, 1984, 2 p., Transl. No. 92; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Kuroiwa, Michinori. 1973. Research by trawl fishery for commercialization of the fishing grounds by Japan Marine Fishery Resource Research Center. Outline of trawl fishery investigation for commercialization in the central North Pacific Ocean--I. Bull. Jpn. Soc. Fish. Oceanogr. 23:42-47. (Engl. transl. by Tamio Otsu, 1984, 7 p., Transl. No. 95; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Nasu, Keiji, and Takashi Sasaki. 1973. Surveys of the mid-Pacific seamounts by the R/V Kaiyo Maru. Bull. Jpn. Soc. Fish. Oceanogr. 23:56-70. (Engl. transl. by Tamio Otsu, 1984, 17 p., Transl. No. 93; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Tanaka, Tamotsu. 1984. Characteristics of the southern water skipjack tuna fishing condition during the FY 1983 season (May 1983 to February 1984) (Showa 58-nendo nanpo katsuo gyokyo no tokucho). Data prepared for presentation at fiscal year 1984 Skipjack Tuna Research Conference, 9-10 April 1984, Tokyo, Japan; provided by the Tohoku Regional Fisheries Research Laboratory. (Engl. transl. by Tamio Otsu, 1984, 15 p., Transl. No. 94; available Southwest Fish. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

HONOLULU LABORATORY
Honolulu, Hawaii

Insular Resources Investigation

Cooperative Research with Japanese is Successful

Dr. George W. Boehlert, Chief, Insular Resources Investigation, returned from a month-long research visit to Japan sponsored by the National Science Foundation United States-Japan Cooperative Science Program. In this particular project of the program, the overall goals are to consider reproduction, embryonic energetics, and larval rearing and ecology in the rockfish genus Sebastes. Work was conducted at the Hokkaido Institute of Mariculture in Shikabe, and at the Faculty of Fisheries, University of Hokkaido, in Hakodate, Japan. This work followed up research conducted by Boehlert and Mary M. Yoklavich in Oregon, which demonstrated that S. melanops is viviparous rather than oviviparous. In Japan, the target species was S. schlegeli, a species used for aquaculture purposes there. The eggs of this species weigh approximately 4 to 5 times more than those of the eastern Pacific species of Sebastes, but the research conducted during this visit demonstrated that this species is also viviparous, and the females provide significant energy to embryos during gestation. Other components of the project that Boehlert and the Japanese scientists are conducting include studying mechanisms of nutrient uptake and dynamics of nutrient transfer from maternal to embryonic systems.

Submersible Research Proposals Submitted

In response to a request for proposals from the NOAA Office of Undersea Research, personnel in the Insular Resources Investigation planned and submitted proposals for submersible research on deepwater shrimp and fish resources. The proposals included "Density of deepwater shrimp, Heterocarpus laevigatus, and factors affecting shrimp trap catchability," prepared by Reginald M. Gooding, Fishery Biologist, and Dr. Jeffrey J. Polovina, Leader, Resource Assessment Investigation of the Mariana Archipelago Program, and "Population assessment, fishery habitat, and behavior of living resources of the southern Emperor-northern Hawaiian Ridge seamounts," prepared by Dr. Boehlert and Dr. Stephen Ralston, Fishery Biologists. The proposals are designed to address a variety of questions on the fishery biology of these species.

Options Paper Prepared

Dr. George Boehlert prepared an options paper on seamount groundfish resources in response to a request from the Western Pacific Regional Fishery Management Council (Council). Among the options discussed were closure of Hancock Seamounts to foreign fishing, which currently has a total allowable level of foreign fishing of 1,000 metric tons (MT). Soviet data received

recently by the Honolulu Laboratory suggest that historical catches are much higher than previously supposed. Soviet estimates of standing stock of pelagic armorhead, Pentaceros richardsoni, in the southern Emperor-northern Hawaiian Ridge seamounts were as high as approximately 380,000 MT. Current models of armorhead stock dynamics prepared by Dr. Jerry A. Wetherall, Leader, Pelagic Stock Assessment Program, will be revised to incorporate the new data.

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James H. Uchiyama, Chief Scientist for Townsend Cromwell cruise TC-84-05, spent the early part of the month preparing for the June 18 departure. During the cruise, lobster trapping experiments in the Northwestern Hawaiian Islands, experimental fishing, research on Hancock Seamounts, and initial attempts at artificial fertilization experiments on snappers (Lutjanidae) and alfonsin, Beryx splendens will be conducted.

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Research assistants Robert L. Humphreys, Jr., and Darryl T. Tagami worked on data analysis, including CTD, XBT, and bathymetry data from Townsend Cromwell cruise TC-84-03. There have been problems with data from the CTD tapes collected at the beginning of the cruise.

Fishery Management Research Program

Honolulu Laboratory Scientists Attend Council Meeting

The 31st meeting of the Scientific and Statistical Committee (SSC) of the Council was held June 11-12, 1984, in Wailea, Maui. Dr. Robert A. Skillman, Leader, Fishery Management Research Program (FMRP), represented Laboratory Director Richard S. Shomura at the meeting and presented the options paper on seamount groundfish resources which had been prepared by Dr. George Boehlert, as well as reports on the FMRP's work on pelagic management unit species catch per unit of effort vessel inventory, and spiny lobster escape vent experiment.

Samuel G. Pooley, Industry Economist, presented a summary of the progress of current socioeconomic projects, and a description of the Honolulu Laboratory's proposed fiscal year 1985 projects, which will be presented at the meeting of the Southwest Fisheries Center (SWFC) and Southwest Region (SWR) economists. The latter projects are based on needs identified by he SSC and the Council. Pooley also attended a meeting of the Council's pelagic management unit species planning team.

David C. Hamm, Computer Systems Analyst, gave a status report on Western Pacific Fishery Information Network (WPACFIN) and participated in two pelagic management unit species planning team meetings that were held to discuss data

requirements. The WPACFIN Fisheries Data Coordinating Committee met after the SSC meeting to discuss subjects such as data confidentiality and transfer schedules. Representatives from all WPACFIN agencies were present. One of the significant agreements reached was to adopt a quarterly (rather than annual) data transfer schedule for major data bases in American Samoa, Guam, and Saipan. This will make it possible for WPACFIN to be more responsive to some of the data needs that were identified during the meeting.

Laboratory Trials of Escape Vent Experiment Completed

Research assistant Alan R. Everson completed four laboratory trials on the spiny lobster escape vent experiment before departing on the Townsend Cromwell to conduct field trials of the experiment. The laboratory trials indicated that lobsters below legal size (<77 mm carapace length) escaped at escape vent heights of 54, 55, and 56 mm and legal lobsters were retained. The exeriments will enable managers to rationally decide on the optimum vent height. The laboratory data are now being statistically analyzed using response surface and other procedures, and a report on this phase of the experiment will be prepared.

Research assistants Victor A. Honda and Bert S. Kikkawa, Gary L. Kamer, Statistican, and Daniel R. Locey, NOAA Jr. Fellow, assisted Everson in fabricating the experimental lobster pots for the cruise. Honda also departed on the Cromwell to participate in the cruise.

Summary Reports on Longline Fishery to be Prepared

In an effort to resume preparation of summary reports on the American Samoa longline fishery for the tuna industry in American Samoa, Daniel Locey has prepared digital contour plots of fishing statistics. Included in the summaries are fishing effort in days fished, catch in numbers of albacore, yellowfin tuna, and bigeye tuna, and catch per day fished on a monthly and annual basis by 5° rectangles of latitude and longitude. These contour plots have been prepared for 1982 and will be prepared for other years including 1984 to within one quarter of being current.

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Dr. Robert O. Mendelsohn, visiting faculty fellow in economics, completed his 6-week stay in Hawaii. He has prepared a draft report on concepts of "value" for marine mammals which will be published as an adminstrative report. This work supports marine mammal survey work being done in La Jolla by Dr. Ronda Hageman, visiting faculty fellow in economics at La Jolla, and by Dr. Karl Samples at the University of Hawaii.

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Samuel Pooley reports that two proposals for research in economics in Hawaii were tentatively accepted at the SWFC-SWR economists' meeting, pending approval by the Center Director. These proposals are: expanding the Hawaii cost-earnings study to include time series data collected in cooperation with fishing boat owners, and a summer fellow to do research on cost-earnings methodologies.

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Research assistant Bernard M. Ito worked on sampling uku, Aprion virescens, for a spawning and fecundity study. To date he has weighed and measured over 500 fish and collected over 200 viscera samples.

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Ray F. Sumida, Fishery Biologist, completed work on the details of a billfish catch enumeration project. Sumida has accumulated names and addresses of wholesale firms, prepared an introductory information letter, and identified information to be collected. Actual field interviews for the project will begin soon.

Pelagic Resources Investigation

Paper Being Prepared for Workshop on Marine Debris

Richard N. Uchida Acting Chief of the Pelagic Resources Investigation, continued preparation of a background document for the workshop on "Fate and Impact of Marine Debris." The workshop is planned for late November. The purpose of the paper is to provide rough estimates of the amount of nets used in the major net fisheries in the North Pacific.

COASTAL FISHERIES RESOURCES DIVISION
La Jolla, California

Annual Estimate of the Spawning Biomass of Northern Anchovy Completed

Headed by Dr. Reuben Lasker, the staff of the Coastal Fisheries Resources Division of the Southwest Fisheries Center at La Jolla, California, completed its annual estimate of the spawning biomass of the northern anchovy. The estimate is used to establish the 1984-1985 optimum yield according to a formula implemented in the recently revised North Anchovy Fishery Management Plan.

The biomass of anchovy was estimated by the "Egg Production Method", developed by scientists at the La Jolla Laboratory, which combines information on anchovy egg abundance in the ocean and egg production rates of spawning fish.

Two spawning areas were apparent: near San Francisco and off southern California. There was an unusual absence of spawning off northern Baja California, although immature anchovies were present. The estimated anchovy spawning biomass is less than half last year's estimate. The decline appears to be due to weak recruitment, poor growth, and perhaps higher than normal natural mortality during the "El Niño" phenomenon (influx of abnormally high water temperatures) of last year.

Coastal Eastern Pacific Population Biology of Fishes
Reproductive Analysis of Skipjack Completed

Biological technician Beverly Macewicz completed an analysis of 12 skipjack, Katsuwonus pelamis, ovaries taken in the South Pacific by Dr. Robert Kearney, South Pacific Commission, Noumea. The objective of this project was to determine if the reproductive analysis developed for the northern anchovy, Engraulis mordax, was practical for skipjack. John Hunter and Macewicz concluded that it is practical to do such work, although extensive field sampling would be required.

The analysis revealed that the females either had spawned recently or had inactive atretic ovaries. Three of the fish had postovulatory follicles of about the same age, indicating a spawning frequency of 25% for the sample. This indicates an average interval of four days between spawnings for the sample as a whole, although individual females might be spawning on a daily basis. The most unusual feature was that although the spawning frequency was high, only 33% of the fish had active ovaries and two of these fish even had some atresia. This indicates that spawning was probably close to ending. A

high spawning frequency in a sample with a high incidence of atretic, inactive ovaries is very unusual and has never been seen in northern anchovy populations. It may mean that when skipjack have active ovaries they spawn very frequently, perhaps every 1-2 days, and those that are unable to maintain such a high rate of spawning simply resorb the ovary. They might reactivate the ovary sometime later in the year once their condition improved. If this striking heterogeneity in reproductive state is characteristic of skipjack, it could provide useful insight into the energetics of skipjack populations.

Study of Post Upwelling Plankton Communities of the Anchovy Spawning Environment Nears Completion

Drs. Robert Owen and Angeles Alvariño, assisted by Pete Paloma, Sharon Hamer, and Teresa Arcos (the latter from Scripps Institution of Oceanography) are completing their enumeration and study of samples to describe plankton communities of the anchovy spawning environment. The group is working on mesoscale spatial variation of phytoplankton and small zooplankton concentration and composition. They expect to ascertain from their data temporal variation in and beyond the anchovy habitat off southern California based on a variety of shipboard and satellite observations made in April 1981. These observations defined the environment from which sample sets were drawn for enumerations of small plankton: a 200 km plume of water strongly influenced by coastal upwelling of a few weeks duration, a relict plume 1-2 months old, and oceanic water with no signatures of upwelling influence. Allocation of spawning effort in the area by the northern anchovy, Engraulis mordax, was inferred from the observed distribution of their eggs and larvae. Recent spawning effort was restricted to the region inshore and south of the new plume and was highest near the plume limits. Relict plume and offshore oceanic water were devoid of spawning products.

Compared with ambient oceanic water, core water of the new plume was cooler by about 3° C, more saline by 0.3 o/oo, and richer in chlorophyll by factors of 30-90. Nitrate, nitrite, phosphate and silicate concentrations were elevated in the mixed layer of the new plume. Vertical gradients of these nutrients, measured at the pycnocline, were generally greater in the new plume and the proximity of the pycnocline to the sea surface was much less; thus continuous local enrichment of the photic layer is likely to have occurred in the new plume. Also likely to have contributed to local enrichment was greatly diminished stability in the plume. Vertical sections of density show decrease of vertical gradients in the upper 100 m within plume limits. The destratification occurred within the zone of intensified surface flow associated with the plume and the local Richardson number is likely to have approached the critical value for intensified vertical mixing. Effects of line source upwelling thus appear self-perpetrating well downstream of the primary upwelling. To an extent, local topography may have contributed to the downstream effects. In response, settled volumes of plankton in the new plume were greater by factors of 3-70, consisting of significantly ($p<0.05$) fewer species of copepods and microplankton. The phytoplankton community of the plume was dominated by chain diatoms, mainly Chaetoceros spp. and the zooplankton by Calanus pacificus.

Progress Reported in Otolith Research

John Butler, Fishery Biologist, reports the following developments in research on otoliths. Blanco Rojas de Mendiola, visiting scientist from Peru, has completed dissecting, mounting and measuring the otoliths from yolk-sac sardine larvae reared in the SWFC experimental aquarium. Mendiola and John Butler report that the average size of the focus of sardine sagitta is 6.2 ± .2μm (N=20) for yolk-sac larvae measuring 4.7 ± 2.5 mm notochord length on the day of batching. Mendiola is presently preparing otoliths from sardine larvae collected at sea and from Peru.

Marlene Johnson, NOAA Junior Research Fellow, has completed aging of juvenile anchovies collected by Butler during the 1984 anchovy biomass cruise. These fish ranged in size from 22 to 54 mm (standard length) and were spawned during December 1983 and January 1984. The results suggest an early spawning of northern anchovy during the 1983-84 season.

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Biological technician Susan Longinotti reports that aging of recruit anchovy is nearly completed. Butler and Longinotti expect to begin analysis of the 1983 spawn-date distribution in July. Longinotti and Johnson have also begun analyzing the otoliths of white seabass larvae reared in the SWFC experimental aquarium by Refik Orhun, SDSU.

Butler has recently returned from a CalCOFI cruise on the Scripps research vessel, New Horizon. Special tows were taken off Baja California and preserved in alcohol for analysis of larval sardine otoliths. Special tows were also taken on the last 24-hr station for live euphausiids. The euphausiids were sorted from a large volume of doliolids and maintained alive until the end of the cruise. Fishery biologist Gail Theilacker will use the euphausiids for larval fish predation studies.

Batch Fecundity of Peruvian Sardine and Northern Anchovy Compared

Dr. Nancy Lo conducted a statistical analysis on the batch fecundity estimation of Peruvian sardine based on data collected by Dr. J. Alheit of Programa Cooperativo Peruano - Aleman De Investigacion Pesquera, Instituto Del Mar Del Peru. The objectives of Lo's study were to determine the effect of location and number of ovarian tissues on the estimation of sardine batch fecundity, determine the functional relationship of batch fecundity and (ovary-free) fish weight, and compare batch fecundity parameter values between the Peruvian sardine and northern anchovy.

To answer the first two questions, Lo used data from 60 fish to count the number of hydrated eggs and record sample tissue weight from 6 tissue samples (3 from each ovary). The results of her study show that the difference

between egg densities (number of eggs per gram of ovary) from two ovaries was not detectable. However, the egg densities taken from three locations (distal-dorsal-surface, center inside and apical-ventral-surface) were not all the same. The egg density from the distal-dorsal location was consistently lower than those taken from the other two locations. Thus, the recommended procedure is to take more than one tissue sample from the posterior position.

		Positions I	II	III	Total
R	y/z	2055	2265	2310	2210
	s	349	380	445	407
	n	60	60	60	180
L	y/z	2060	2366	2324	2250
	s	359	400	343	391
	n	60	60	60	180
Total	y/z	2058	2316	2317	2230
	s	352	392	396	399
	n	120	120	120	360

I: distal-dorsal (surface).
II: center (inside).
III: apical-ventral (surface).
R: right ovary.
L: left ovary.

The optimum number of tissue samples was determined according to the procedure previously developed for northern anchovy batch fecundity by Lo. The statistic used was the ratio of the variance of egg counts within the ovary and the variance about a model fitted to batch fecundity and fish weight. The ratio for Peruvian sardine is small (0.35), therefore, two tissue samples from each fish should be sufficient.

To determine a proper model for batch fecundity (Y) and fish weight (X), 31 more fish were added to the original collection of 60 fish. For each of 91 fish, three ovarian tissues were taken from the larger of the two ovaries and the estimated batch fecundity (Y) was then computed as the average number of eggs per gram of ovary multiplied by total ovary weight. The model $Y = a + b \ln(X)$ gives the highest $r^2 = 0.55$. The linear model has $r^2 = 0.41$ (Table 1).

Table 1. Batch fecundity related parameters for Peruvian sardine and northern anchovy.

	Peruvian sardine			Northern anchovy (1978-83)		
	Mean	SE	N	Mean	SE	N
Female weight (gr) (ovary free)	160	3	91	3	0.07	419
Ovary weight (gr)	28	0.93	91	15	0.28	419
Regression estimate of batch fecundity per female gram	283	36	91	614	0.19	419
Best model	y=-213467+51401 lnX			y=a+bX		

To compare batch fecundity parameters between Peruvian sardine and northern anchovy, Lo also included anchovy data collected in 1978-83. The overall (1978-83) average batch fecundity per gram of spawn is 614 (SE=0.19) and the batch fecundity is 8,435 (SE=213). The average batch fecundity per gram of female sardine is 283 (SE=4) and the average batch fecundity is 54,567 (SE=136). Female sardines (156 gr) are larger than fe ale anchovies (15 gr), whereas the batch fecundity per gram of female sardine is half that of anchovy (Table 1). The variation of eggs per gram of ovary from tissue samples within ovaries of sardine is also half of that of anchovy. The anatomical position of the subsample used to estimate batch fecundity is more important for the sardine compared with the anchovy. The egg density from the posterior location of the sardine ovary seems to be consistently lower than other parts of the ovary. The egg densities from the right and left ovary were similar for both sardine and anchovy.

The batch fecundity-female weight (ovary-free) relationship seems different between anchovy and sardine, although the linear relation is adequate for both species. For northern anchovy, either an exponential or linear model has been used in the past, and the linear model is the current one used. For sardine the exponential model does not explain the relationship as well as $Y = a + b \ln(X)$. For direct comparison of these two species, the linear model was chosen, because the regression coefficient is the batch fecundity per gram of female.

Coastal Eastern Pacific Fisheries Environmental Investigations

U.S. Albacore Fishery Off to Early Start

The fishery for albacore off southern California is off to an exceptionally early start this year, both for sportboats and for commercial boats. Sportboats began making catches in late May off northern Baja California. Fishing continued to be excellent for sportboats through June in an area from 40 to 100 miles south-southeast to west of San Diego, California. Most of the albacore catches were fish weighing 11 to 20 pounds with some larger fish to 30 to 35 pounds. Total landings recorded at the San Diego sportboat docks were from 1,000 to 4,000 fish per day with fishermen averaging between 2 to 8 fish/day.

Fish reports from commercial boats indicated very good fishing this early in the season. Jigboats usually averaged between 50 and 150 fish/day with top scores better than 300 fish/day. Exact catch figures for baitboats are not available, but catches up to 6 tons/day have been reported. Most of these fish weighed from 10 to 20 pounds each. The water temperatures in the areas of fishing were 66 to 68°F by the end of June.

The price negotiated for albacore is $1,400/ton for albacore larger than 9 pounds and $1,125/ton for albacore less than 9 pounds.

Studies Continue on Application of Satellite Data to Fisheries

Dr. Paul Fiedler, Oceanographer, continues to explore applications of sea surface temperature and phytoplankton pigment imagery derived from satellite data. Work during 1982-1983 is summarized in a review co-authored with Drs. Gary Smith (NWAFC) and Dr. Michael Laurs, to be published in the NMFS Marine Fisheries Review later this year. Monitoring of last year's California El Niño culminated in the publication of, "Satellite observations of the 1982-1983 El Niño along the U.S. Pacific coast" in June 15 issue of Science.

For the Coastal Fisheries Division, the possibility of planning CalCOFI egg surveys with pre-cruise satellite imagery is being investigated by Dr. Nancy Lo with historical CalCOFI data and satellite imagery provided by Fiedler. Dr. Tilman Pommeranz, visiting researcher, is using SST imagery to help interpret the results of an intensive, depth-stratified study of northern anchovy spawning activity in 1980. Imagery has also been processed to cover heavy anchovy catches in July 1981 and 1982 by the Zapata's commercial fishing fleet out of Ensenada.

For the Oceanic Fisheries Division, Fiedler processed SST and pigment images for Charles Oliver's study on distributions of pilot whales around Santa Catalina Island, observed in winter aerial surveys since 1980. Steve Reilly and Doug DeMaster have been provided with imagery covering marine mammal surveys in the tropical Pacific in the Southern California Bight. For the Honolulu Laboratory, Fiedler is processing SST and pigment imagery that may reveal surface signatures of the Emperor seamounts, extending northwest from Midway Island and the site of increasing pelagic fishery activity.

For the Northwest and Alaska Fisheries Center, which has joined the SWFC in supporting Fiedler's work, satellite imagery has been processed for Dr. Art Kendall to interpret the results of ichthyoplankton surveys off Washington and Oregon, conducted twice yearly since 1980. This study will focus on the northern anchovy stock assocated with the Columbia River plume.

Fiedler has also completed the development of an algorithm to process efficiently coastal Zone Color Scanner data at Scripps Satellite Oceanography Facility (SSOF). SWFC and Scripps scientists previously relied on the Scripps visibility Laboratory to process these data. Imagery is now also being processed for a number of other projects that had been held in abeyance, including 1983 marine mammal surveys and 1984 CalCOFI surveys.

Ecology and Taxonomy of Fishes

Ahlstrom Symposium Volume Nears Publication

The editing of the Ahlstrom Symposium volume is nearing completion according to Dr. H.G. Moser, editor-in-chief of the book. Task members received and corrected galley proofs of their papers this month while Moser corrected galley proofs for the entire book. Other editorial committee members, Dr. Arthur W. Kendall of the Northwest and Atlantic Fisheries Center, and Michael Fahey of the Northeast Fisheries Center, also reviewed the manuscript in its entirety. Dr. William Richards of the Southeast Fisheries Center is the managing editor for the volume and will compile author's corrections. The line changes should be completed in about 3 weeks and page proofs should be ready for Moser and Richards to review by the end of July.

Moser estimates that the book should be ready for distribution in late summer 1984. It will consist of about 800 pages, 179 tables, 364 figures, including many full page plates, and a literature section of about 3,000 citations.

A brochure advertising the book was designed and produced by Moser with the help of illustrator Roy Allen and distributed to marine and freshwater scientists and research institutions around the world. The American Society of Ichthyologists and Herpetologists (ASIH) will publish the book as their Special Publication No. 1. Prepublication sales indicate that ASIH will be able to publish the book at no cost to the society.

Task Leader Attends Early Life History Symposium

Task leader Geoffrey Moser attended the Early Life History/Larval Fish Conference sponsored by the American Fisheries Society at the University of British Columbia, Vancouver, B.C., May 6-10 and presented a talk on the larval development and distribution of the aurora rockfish which he co-authored with biological technician Elaine Sandknop and fishery biologist David Ambrose. Following the meeting some of the participants traveled to La Jolla to consult and work with the staff in the Ecology and Taxonomy laboratory: Dr. Yoh Yamashita of the Ocean Research Institute, University of Tokyo, held

discussions with Moser on the larvae of myctophid fishes from the Sea of Japan. Pilar Olivar received assistance with her myctophid larvae collection from off South Africa. Anthony Miskiewicz, University of New South Wales, Australia, consulted on nearshore and estuarine fish larvae. Dr. Tetsushi Senta, Nomo Fisheries Laboratory, Nagasaki University, Japan, discussed his work on milkfish larvae with task members.

Commercial and Recreational Fisheries Research for Management

Pacific Mackerel Harvest Formula Evaluated

Commercial harvest of Pacific mackerel is regulated by a State of California law which stipulates that the annual quota is 20% of the excess over 20,000 short tons total biomass (age 1+). Partly as a result of this management formula approach, the fishery has been rehabilitated from a severely depleted state in the early 1970's to a highly productive fishery by historical standards. In the last few years the wetfish fleet has become progressively more dependent on Pacific mackerel, a species with history of extreme natural variability. The present formula was developed mainly as the result of negotiations between the fishing industry and state management agency, with minor input of biological analysis. The industry has expressed some interest in modifying the harvest formula toward a more intense exploitation rate (increase the percentage of the excess to 30%), and scientists from the California Department of Fish and Game (CDF&G) are interested in how the present formula performs relative to alternative policies.

Dr. Alec MacCall, Fishery Biologist, has undertaken a study of alternative Pacific mackerel harvest quota formulas as part of a California Wetfish Management Information Document being prepared for the SWFC, SWR, and CDF&G. The analysis is based on an age-structured population model which uses the historical pattern of anomalies in recruits per spawner, corrected for changes in spawner abundance according to a Ricker stock-recruitment relationship. Various harvest formulas are applied to the simulated population, "replaying" the 40-year history from 1928 to 1967 when the resource collapsed. The results of this investigation are useful not only for evaluating Pacific mackerel fishery management, but also for evaluating quota formulas in general, especially for highly fluctuating resources.

Results pertaining to Pacific mackerel are:

The present harvest formula produces an average of 23,000 m tons (25,000 short tons) per year, and appears to be good relative to alternative formulas from the standpoint of maximizing yield (Figure 1).

Slightly higher yields (up to 8% greater) could be obtained by formulas which require extreme variability in annual harvests.

Changing the formula to 30% of the excess over 20,000 short tons total biomass would result in a 6% decline in average annual yield relative to the present formula, and would increase the frequency of low quota years (Figure 2) due to lower average abundance.

The severe decline of the resource in the late 1960's could not have been avoided by any management policy, and would have occurred even in the absence of any fishery harvest.

Although the stock-recruitment relationship is not statistically significant (stock size accounts for less than 5% of the variability in recruits per spawner), the simulation reaches unreasonably high unfished stock sizes if the stock-recruitment curve (or other strong compensatory mechanism) is not included in the model. This is strong evidence that compensation had occurred in the resource, and shows that simple tests of statistical significance may not incorporate all the information relevant to evaluating such phenomena.

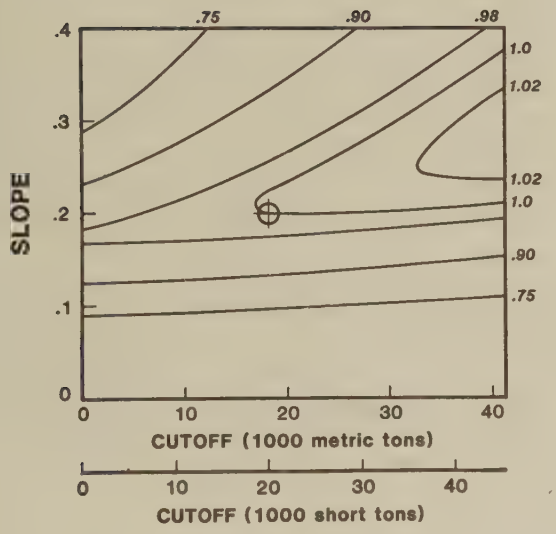


FIGURE 1

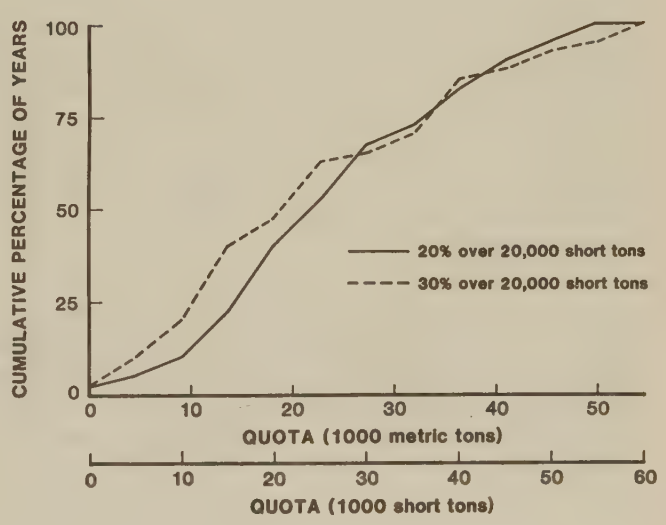


FIGURE 2

Linear variable harvest formulas which close the fishery when abundance falls below a "cutoff" level (presently 20,000 short tons for Pacific mackerel) can produce a larger average yield than does the best constant effort (equivalent to cutoff = 0) fishery, but entails higher catch variability.

As the size of the cutoff becomes larger, average annual yield become insensitive to a wide range of "slopes" (fractions of the excess over the cutoff which may be harvested). This suggests that the harvest formula approach (including a cutoff) may produce nearly optimal management despite relatively poor or inaccurate knowledge, and may be particularly appropriate for developing and little-studied fisheries.

Towed Sonar Specifications Written for NOAA Ship Jordan

Specifications for a towed body housing, side-looking sonar transducer array have been written by Drs. Richard Methot, Paul Smith and Jay Barlow, with advice from the hydroacoustic group at the Northwest and Alaska Fisheries Center. If purchased, this equipment will become part of the acoustic package on the NOAA Ship David Starr Jordan. Currently the package contains a Simrad EK-400 transceiver, and a 38 kHz hull-mounted, down-looking transducer. The transceiver penetrates an electrical pulse, the transducer transforms this pulse into an acoustic pulse which then creates an electrical signal from the returning echoes. The transceiver displays this electrical signal in a recognizable form --strong echoes appear as dark patches on a paper roll. A color video display was purchased recently to provide an improved presentation over the paper roll. There are also plans for a 120 kHz hull-mounted, down looking transducer which will improve detection of smaller organisms (squid and euphausiids). The above equipment is suitable for real-time qualitative detection of organisms that tend to form layers deeper than about 20 m below the surface.

The purpose of the towed sonar is to extend the above capabilities to near-surface schooled fish. The equipment proposed to be purchased will have 39 kHz and 120 kHz side-looking transducers and will be towed at 8 knots from a new electromechanical cable. Side-looking transducers mounted in a towed body have several advantages over hull-mounted side-looking transducers including:

- No beam tilting due to the roll of the ship.
- No interference from bubbles entrained around the ship's hull.
- Less interference from surface waves because the towed transducers will be deeper.
- Depth can be adjusted to reduce effects of beam refraction by the thermocline.
- Calibration can be done without the ship.

These advantages seem to outweigh the disadvantages of deploying the towed body.

The next component of the acoustic package is an integrator and Microcomputer. This equipment will receive the analog echo signal from the EK-400 transceiver, digitize the signal and store the digitized data in 50 bins which corresponds to distances from the transducer. These data may then be used for several purposes. If the side-looking data are digitized, then the depth, density and extent of layers can be recorded. This information can be used to allocate net sampling and to estimate relative abundance.

The immediate goal of the acoustic package is to increase the efficiency of trawl surveys. With good acoustic data, it is possible to almost eliminate trawling outside the ephemeral boundary of the target population, and concentrate trawling in regions of high abundance. Consequently, the biological characteristics of the captured specimens will be more representative of the bulk of the population. In addition, a stratified estimate of the population size based directly on the trawl catches will be more precise because the sample size will be greatest in the regions of highest abundance and variance.

OCEANIC RESOURCES DIVISION
La Jolla, California

Biological Systems Investigations

Analysis of Reproductive Seasonality in Spotted Dolphins Completed

Aleta Hohn, Zoologist, reports that analysis of the reproductive season of male spotted dolphins was recently completed.

The question of breeding seasonality in dolphins in the eastern tropical Pacific has been of interest to the SWFC staff working on tuna/dolphin problems. The new work adds information to other recently completed work on peak calving seasons for spotted dolphins (Hohn and Hammond 1983, and Barlow, In Press).

The most common method for determining reproductive seasonality in male dolphins is to use a monthly profile of testis weight. The month(s) of maximum testis weight presumably coincides with the peak breeding season in females. Other methods that are available, but less often applied, are based on histological examination of testis tissue. Breeding seasons should correlate with maximum levels of spermatozoa in the testis, as well as maximum seminiferous tubule diameter and relative lumen size.

Based on all the criteria mentioned above, as well as the Index of Testis Development (see March 1984, Monthly Report), the peak breeding months for male spotted dolphins in the eastern Pacific are April, July and August (Figure 1).

Because the gestation time in spotted dolphins is estimated to be approximatly 11.5 months, the breeding season is expected to occur at the same time as the calving season. The two primary calving months for this stock of spotted dolphins are May and September. This does not correspond to the two peaks in the male dolphins. In fact, the July peak in males is midway between the two calving seasons for females. Some possible explanations are that the northern stock is comprised of more than one population with different breeding seasons and this has confounded the analysis; the estimate of gestation time in spotted dolphins is inaccurate; or delayed implantation

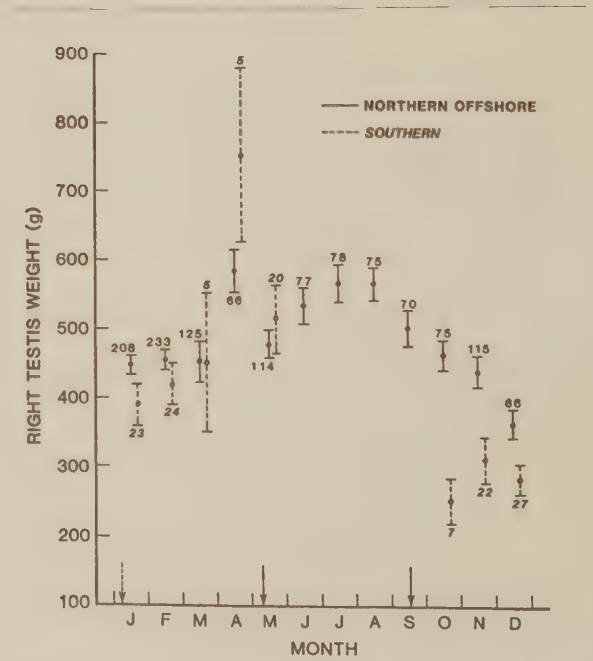


FIGURE 1

occurs. Future research will try to answer these questions and determine whether the same results occur in other stocks and species in the eastern tropical Pacific.

The current analyses are presented in a manuscript, "Reproductive maturity and seasonality in spotted dolphins, Stenella attenuata, in the eastern tropical Pacific", by Hohn, Susan Chivers, and Jay Barlow.

Multispecies Data Management and Fisheries Monitoring Program

Marine Mammal Data Base Revised

Biological technicians Al Jackson and Tom Tumosa and program analyst Ken Wallace report that the species/stock identity of certain dolphins in the mortality/inquiry (tally) data bases have been revised. Revisions were made using results of Senior-Scientist William Perrin's review of sighting records for 1971-1982.

Jackson and Tumosa made the actual corrections using a program written by Wallace comparing all tally record species/stock codes to corresponding sighting record species/stock codes for the years 1971-82. All errors identified by Jackson and Tumosa for the years 1977-82 were corrected. Due to subtle differences in the definitions of the data for the years 1971-76, it was decided to delay any further revisions of these data until after consulting with those who had originally been involved with the coding of those records. In total, 185 of 14,774 tally data base records and 67 of 77,134 marine mammal sighting data base records were revised.

Status of 1984 Dolphin Observer Program Reported

Biological technician Tom Tumosa reports that 15 observers have departed this year on trips aboard tuna purse seiners fishing in the eastern tropical Pacific. Five of the observers were part of the NMFS observer program, 10 were part of the program of the Inter-American Tropical Tuna Commission. To date, one NMFS observer and five IATTC obervers have completed trips while four NMFS observers and five IATTC observers remain at sea. The first NMFS observer to complete a 1984 trip was debriefed upon his return by Tumosa. Data describing cetaceans observed and fishing operations were reviewed and entered into computer files.

Tuna/Dolphin Editing Software Written

Computer programmer Al Coan reports that programs to be used to edit data collected by NMFS tuna-porpoise observers have been prepared for use with the 1984 cruises. Computer programmer Joseph Joy, made the coding modifications and biological technician Tom Tumosa, completed the testing of all of these programs. The software needed to create, update and access the 1984 tuna-porpoise databases has been written and tested by programmer analyst Ken Wallace.

Ecological Fishery Systems Investigations

Structure Operations and Performance of U.S. Albacore Fleet Investigated

Industry economist Sam Herrick reports that he and fellow economist Kevin Carlson recently completed a manuscript entitled,"Vessel characteristics and performance of the North Pacific albacore fleet coastwide summary data base, 1974-1976." The manuscript provides baseline information on the structure, operations, and performance of the harvesting sector of the north Pacific albacore fishery based on data contained in the Coastwide Data Base (CWDB), a comprehensive landings database for all vessels active in west coast fisheries from 1974-1976.

The report describes the characteristics, fishing operations and landings of those vessels in the U.S. fleet that were active in the fishery between 1974 and 1976. During this period over 4,500 vessels landed albacore in the states of Washington, Oregon, and California, and the value of their albacore landings averaged over $18 million annually. Using the CWDB, it was possible to select a subset of the vessels that were active in the albacore fishery and for which albacore contributed significantly to their economic well-being. These vessels were then collectively described and analyzed in terms of their fishing operations and corresponding landings. The CWDB also allowed the short-term dynamics of the fleet to be examined.

Results of analysis suggest that there is no single representative vessel in the albacore fleet. Different vessels land many alternate species; most vessels that land albacore also participate in the chinook - coho salmon and groundfish fisheries and the high ex-vessel revenue vessels participate in the other tuna, and dungeness crab fisheries. Given a certain size vessel and ports of operation it is possible to describe a typical albacore vessel using the CWDB as summarized by the Panel fleet.

In general, an albacore vessel from the CWDB is between 35 and 54 feet long, uses troll gear and often times lands chinook - coho salmon or groundfish. For the years 1974-76 average albacore landings for such a vessel was 14.5 tons and accounted for 51% of its total annual fishing revenues. This vessel generally lands fish at two distinct port areas.

PACIFIC ENVIRONMENTAL GROUP
Monterey, California

New Analysis of Benguela Current Geostrophic Flow Data

Alan Boyd, of the Sea Fisheries Institute of South Africa, Capetown, visited PEG during the months of May and June. During his visit he collaborated with PEG oceanographers David Husby and Jerry Norton in producing new summaries and analyses of environmental data from the Benguela Current system, which is the southeastern Atlantic eastern boundary current system. The Benguela system appears to be an analogue to the California Current system, both in exhibiting similar environmental dynamics and in having a nearly identical assemblage of pelagic fishery stocks. Comparative studies of the eastern boundary current at PEG are designed to indicate crucial environmental-biological linkages by a process of pattern recognition among similar systems, which are incorporated in environment-dependent fishery models.

Boyd added new data from 14 repeated monthly hydrographic surveys (temperature, salinity, oxygen, and nutrients) on a closely-spaced grid of stations. These data allow fine temporal and spatial resolution of advective processes in the principal spawning grounds of anchovy off Southwest Africa. His work with Husby and Norton provides enhanced descriptions of the geostrophic flow fields, subsurface density structure, and wind forcing of upwelling and turbulent mixing off Southwest Africa. The merging of the hydrographic data archive that was brought by Boyd with the data that was previously available to PEG at Fleet Numerical Oceanography Center has essentially doubled the base available for the region. Features identified include the lack of a well-defined gyral circulation pattern in the anchovy spawning grounds and relatively weak vertical current shear over the continental shelf in the southern portion of the study region. Further research will focus on the influence of upwelling and advection on the oxygen minimum layer on the continental shelf.

TIBURON LABORATORY
Tiburon, California

California Salmon Fleet Records Dismal Early Catch

California Department of Fish and Game catch statistics show that as of the early part of June, the 1984 commercial salmon season has been a disaster. Cumulative landings of chinook salmon through the first week of June were about one-third of last year's total at the time and only a little more than one-tenth of the comparable catch made two years ago. Recreational fishermen fared somewhat better, with their cumulative take almost one-half of the level of two years ago. One explanation for the discrepancy between the recreational and commercial results appears to be a reduced growth rate caused by El Nino conditions of previous years. Many salmon have not yet reached the commercial size limit which is greater than the size limit imposed on sport fishermen.

Commercial fishing appeared to be improving, however, according to reports from the end of June.

Fish Communities Investigation

Biological Conditions Returning to Normal off Central California

On a recently completed cruise, members of the Predator-Prey Task found that biological conditions off central California are returning to a more normal state after last year's El Niño. Cruise leader Pete Adams reported that distributions of anchovies, juvenile rockfish and euphausiids were similar this year to pre-El Niño conditions. During last year's El Niño, juvenile rockfish and euphausiids were completely absent, and more southern fishes--Pacific mackerel and barracuda--were abundant. During June of this year, juvenile rockfish and euphausiids were found at offshore stations, and anchovies were found at inshore stations; this is similar to data collected before El Niño. The distribution of salmon, which is a predator of these animals, also seems to be returning to previous seasonal patterns.

Abundance and Distribution of Juvenile Rockfish Surveyed

Members of the Groundfish Analysis Task, Tina Echeverria, Greg Hall, Dr. WIlliam Lenarz, and Sharon Moreland, and other participating scientists, Michael Bowers of the Physiological Ecology Investigation, NOAA Junior Fellow Frank Jacques, fishery biologist Mark Lowry of the La Jolla Laboratory, and Tom Manning and Michele Romero conducted a survey on the abundance and

distribution of juvenile rockfish off central California. A 40-foot bottom trawl was deployed over suitable bottom during daylight hours and a midwater trawl was deployed during the night from the NOAA Ship David Starr Jordan. In order of decreasing abundance of juvenile rockfish caught by bottom trawl the areas were: Point Sur, Monterey, Pescadero, Davenport, Point Reyes, Jenner and San Francisco. In order of decreasing abundance of juvenile rockfish caught by midwater trawl the areas were: Davenport, the Farallone Islands, Point Sur, Monterey, Point Reyes, San Francisco, and Jenner.

Approximately 372 juvenile rockfish were captured in 12 of the 31 bottom trawls. The principal species was identified as Sebastes saxicola; other species included S. paucispinis, S. semicinctus, S. pinniger, S. jordani, S. crameri and approximately three unidentified Sebastes. There were numerous flatfish larvae/juveniles in most hauls.

Approximately 2,653 juvenile rockfish were captured in 49 of the 55 midwater trawls. Some species have still not been identified. The principal species was identified as S. jordani. Other identifiable species were S. paucispinis, S. pinniger, S. goodei, S. levis, S. crameri, S. saxicola and S. semicinctus.

Physiological Ecology Investigation

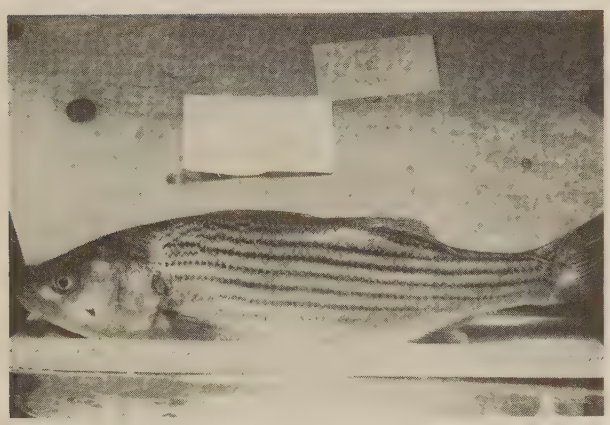
Color Pattern Variation in Striped Bass Studied

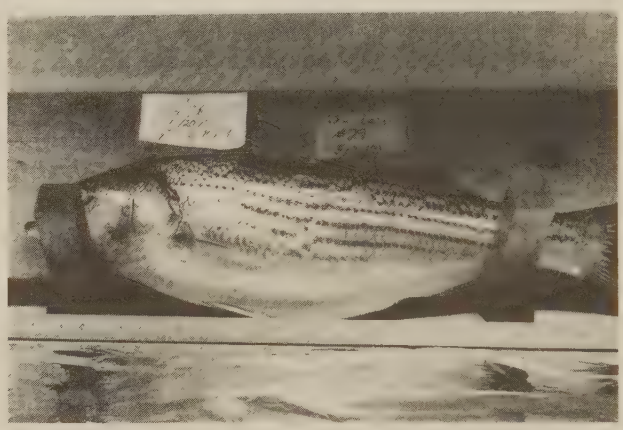
Most studies consider fish populations as more or less genetically uniform entities and rarely consider the possibility that intrapopulation variation interacts with the environment in determining population persistence. In striped bass from the San Francisco Bay-Delta area, for example, most researchers study fluctuations in population size only in relation to environmental variation in fishing mortality and/or outflow and diversion. They have not attempted to measure inherent variability. Jeannette Whipple and Maxwell Eldridge decided to assess inherent variability in striped bass.

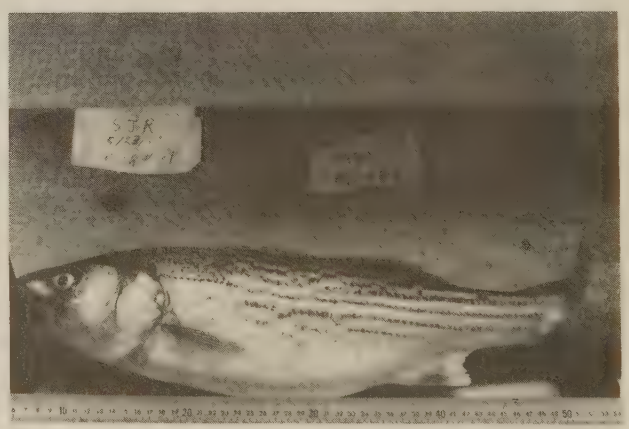
In the course of their striped bass field studies, they observed that the striping or melanistic color pattern of the body was considerably variable. In the San Francisco Bay-Delta striped bass, several color pattern types were observed (Figure 1a-c), with the broken-stripe pattern predominant over the solid-striped type.

The distribution of different color pattern types varies spatially. For example, most striped bass from the East Coast appeared to have solid stripes, with only an occasional break in the solid-stripe patterns, resembling "chains" (Figure 1c), as well as intermediate striping patterns (Figure 1b). There were some fish of all patterns in all areas sampled, but one type was usually predominant.

Figure 1. Color pattern variants of striped bass from the San Francisco Bay-Delta estuary. Prespawning adults captured from the San Joaquin River off Antioch by California Department of Fish and Game in 1983 monitoring program. Photographs of each fish taken during autopsy procedure. (Whipple, Jung and Fisher, 1984. Histopathological manual for monitoring health of striped bass in relation to pollutant burdens. Submitted as a NOAA Technical Report for review by Laboratory Director.)







a. (upper left) Solid-stripe color pattern. Dorsal and ventral stripes solid. Even in solid-stripe fish there is a small amount of breakage of anterior-dorsal stripes. b. (upper right) Intermediate color pattern. An example of many variants showing intermediate degrees of breakage. c. (right) Broken-stripe color pattern. Breakage of all stripes, giving "chain-like" appearance.

The frequency distribution of color pattern types also varied temporally in the San Francisco Bay-Delta population. The proportion of the rarest type (solid-stripe) varied among years. A higher frequency of broken-stripe fish occurred in 1980 and 1983, while more solid-stripe fish occurred in 1978, 1981 and 1982. There was also variation throughout the spawning season, indicating that different schools migrating through the Delta to spawn may have varied, each school having a characteristic pattern.

Multivariate (principal component factors) analyses of field data revealed a number of associations with color pattern. When comparing fish with broken-stripe pattern (chain-like appearance) with fish showing a solid-stripe pattern, some major differences were observed. a) Broken-stripe fish were deeper-bodied and usually had more fat in gonad and liver tissues. When sexually maturing, they had lower liver somatic indices (LSI). When not sexually maturing, they had higher LSI and more lipid in the liver than solid-stripe fish. b) A higher proportion of broken-stripe fish were younger and smaller. A higher proportion of solid-stripe fish were older and larger. c) Broken-stripe fish matured earlier, with ovaries showing later maturation stages and earlier vitellogenesis. d) Broken-stripe fish had lower concentrations of petroleum and chlorinated hydrocarbons and metals. Solid-stripe fish had higher levels of most pollutants. e) The two types appeared to differ in immunity to parasites and disease, as indicated by parasite burdens, inflammatory reactions to parasites, and higher levels of cestode larvae and lesions occurring in broken-stripe fish.

These results led Whipple and Eldridge to hypothesize that there may be several genetic phenotypic differences among striped bass related to color pattern type. These differences may be associated with variation in migratory behavior and the following physiological responses: respiration rates, growth rates, distribution of lipid in muscle, liver and gonads, reproductive maturation rates, rates of pollutant uptake and immunity.

On a population level, the different types may constitute different life-history strategies for adapting to the highly variable physical environment of the San Francisco Bay-Delta estuary. From year to year, there are significant differences in outflow from this estuary, and variations in the abiotic and biotic environment affecting striped bass.

To summarize, the solid-stripe and broken-stripe subpopulations vary in the following life history characteristics.

SOLID STRIPE COLOR PATTERN	BROKEN STRIPE COLOR PATTERN
Life History Characteristics	
Faster growth rate	Slower growth rate
Larger maximum size; slimmer-bodied	Smaller maximum size; deeper-bodied
Longer life	Shorter life
First reduction at later age (5 or 6)	First reduction at earlier age (4 or 5)
Greater number of reproductions	Fewer reproductions
Slower egg maturation rate	Faster egg maturation rate

Hypothesis-Best Adapted to Following Environments:

Offshore (more migratory)	Bay and Delta (less migratory)
Higher net flow from estuary	Lower net flow from estuary
Lower salinity during spawning season	Higher salinity during spawning season
Lower temperature (Suisan Bay nursery)	Higher temperature (Central Delta nursery)
High predation rate (larger, faster)	Lower food density for young
Greater parasite resistance (higher immunity, migratory behavior)	Higher pollution tolerance

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Laboratory experiments conducted so far substantiate that variation, probably genetic, is related to color pattern. In experiments with juveniles from the same cohort and age (same female fertilized by two different males), significant correlations were found between degree of breakage in the striping pattern and the standard length ($n = 300$; $r = 0.417$; $P < 0.01$). Solid-stripe fish exhibited a faster growth rate and were larger and slimmer-bodied than those with varying degrees of stripe breakage. In these sexually immature juveniles, LSI was also greater in fish with a broken-stripe pattern similar to nonspawning adults from the field.

Although not quite significant ($P = 0.10$), there was an indication that broken-stripe juveniles accumulated lower concentrations of benzene in the liver and higher concentrations in the mesenteric fat than solid-stripe fish in laboratory exposure experiments.

In one laboratory experiment with adult females, the sample size was relatively small (18 females), but there was an indication that females with a broken-stripe pattern matured earlier, with earlier vitellogenesis, just as observed in field fish.

Additional data analyses and syntheses may further verify the hypotheses, which were based on preliminary data. This work wil be continued by investigation chief Jeannette Whipple and Maxwell Eldridge and reported in future manuscripts.

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The paper "Acute toxicity of seven alicyclic hexanes to striped bass and bay shrimp in seawater" by Peter Benville, Jeannette Whipple and Maxwell B. Eldridge has been accepted for publication in California Fish and Game. Whipple has completed a summary of striped bass research for managers and

regulators and the manuscript is now in preparation as a NOAA Administrative Report. John Greeley has finished editing "Histopathological manual for monitoring health of striped bass in relation to pollutant burdens" by Jeannette Whipple, Marvin Jung and Rahel Fischer. It has been submitted to the Laboratory Director for review as a NOAA Technical Report, Whipple has also completed the laboratory section of the final Cooperative Striped Bass Study (COSBS) report, being done with the California State Water Resources Control Board, and has submitted it to Marvin Jung for compilation with discussion of field results.

FISHERIES INFORMATION SYSTEM & AUTOMATIC DATA PROCESSING

Financial Reporting System Reports Produced and Distributed

The Financial Reporting System (FRS) reports with information on expenditures through May 1984, were produced and distributed on June 19. Ben Remington, Executive Officer, reviewed the reports and noted some calculation errors in the summary report.

On June 20, Remington, Bob Nydam, Rob Bistodeau, and Dorothy Roll met with David Mackett and John Carr to review the specifications for the FRS and define the activities required to produce the remaining four summary FRS reports. With Mackett as facilitator, the group mapped out the PERT chart for completing the FRS reports.

WPACFIN Activities Reported

David Hamm reports that implementation of WPACFIN continues. An additional Apple Microcomputer and another Corvus hard disk system have been added to the network. The equipment will be installed at the Guam Division of Aquatic and Wildlife Resources (DAWR). The DAWR recently processed data from the offshore and inshore creel surveys, and participation data from September 1979 through March 1984, and also transferred all files to WPACFIN. Data from the Guam Fishermen's Coop were also received by WPACFIN. The data base is now current through May 1984.

Hamm also reports that the Guam Offshore Expansion System (GOES) on the Apple system was modified in response to comments from DAWR personnel, and a user's guide was developed for the system and sent to DAWR for comments. For Guam coop data, dBase II menu driven system was developed on a laboratory's Molecular Super Microcomputer to handle all processing and report generation. The system contains modules for editing incoming data, updating data bases, and generating six different reports for the Guam Coop data.

During a recent visit to the Office of Marine Resources in American Samoa, Hamm designed data bases for capture of length-weight data (primarily bottomfish), data on purse seiner activities, and data on tracking of the status of vessels under contract to the canneries. Updates and modifications were made to several files including the major commercial landings data base.

Hamm also completed revisions of two documents: "Guidelines for data quality control and file management procedures," and "WPACFIN organization and design, status and issues, June 1984." Also, WPACFIN personnel completed Beta-testing of the latest version of a data base management software, DB Master, and sent a report on the results to the manufacturer.

Shipboard Requirements Committee Reviews Design Proposal for Microcomputer

The Shipboard Requirements Committee, consisting of Dorothy Roll, Chair, Al Coan and Wes Parks from the Oceanic Fisheries Resources Division, Rich Charter and Ron Lynn of the Coastal Fisheries Resources Division, and Susan Iacometti of the ADP Group, met on June 6 to consider the hardware and software design proposal for the Molecular Super Microcomputer 15-8 intended for the NOAA Ship David Starr Jordan.

In a report submitted to Director Barrett on June 22 the committee recommended software required to implement the system at a minimum level, i.e., the system executive program for collecting, calibrating and filtering the data from the CAMAC to the Molecular 15-8 and the general purpose activity programs (the captain's log, vessel activity, cruise track and weather logs). The CAMAC is the electronic device which collects data from the sensors such as wind speed and water temperature.

ADP Plan Developed for Southwest Region

Data systems manager Fred Kellenberger has developed an ADP plan for the Southwest Region which has been approved by Director Charles Fullerton and immediate steps have been taken to begin implementation. The appropriate justification and procurement papers have been prepared and sent to NOAA for approval of the 11 Microcomputers required by the Region in order to put the plan into operation.

Kellenberger recommended an integrated Microcomputer-based information and telecommunication support program. Specifically, IBM-XT's, PC's, and portables were recommended as the hardware base while the recommended software included word processing, electronic spreadsheet, data base, communications, graphics, statistical, and language processor packages. Kellenberger indicated that this approach offered a number of advantages as follows: direct support for the current and long-term regional ADP activities; modular and incremental growth potential; cost effective computer hardware and software support; unified approach to office automation, data processing, data transfer and information storage; industry wide compatibility of programs and data; local and remote maintenance capabilities; stage-wide implementation of the ADP Plan; communications capability for remote data access and electronic mail.

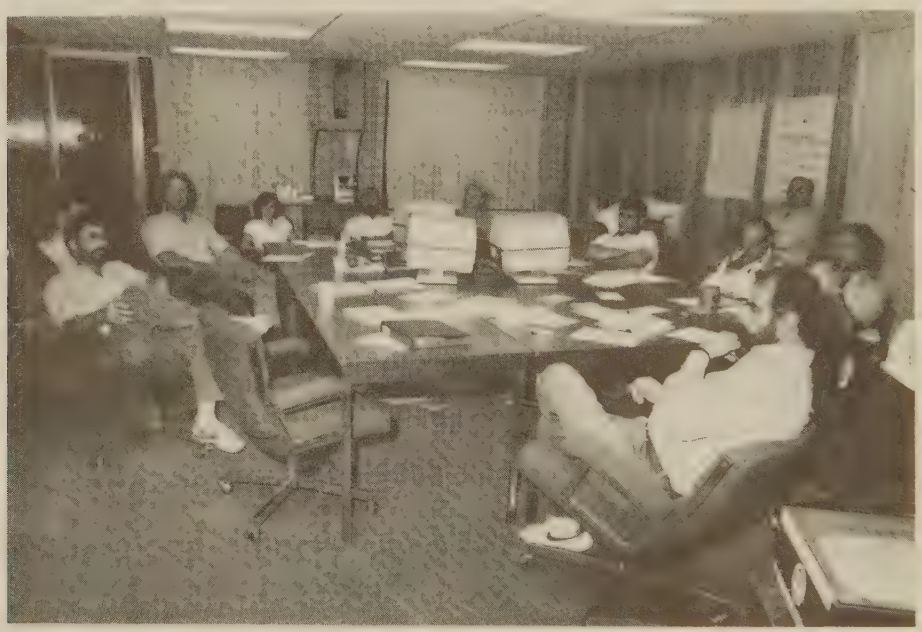
The ADP Plan devised for the SWR will include three phases of implementation. During the first phase, the appropriate hardware/software units for remote access and stand-alone, direct support systems will be installed. The second phase would establish multi-user clusters with local data sharing, while the third phase calls for an integrated office automation/professional staff local area network.

According to the schedule set forth for the plan, initial acquisition of equipment and software would begin during the early summer of 1984.

Preliminary training of staff and installation of equipment would take place during July-September and phase one of these operations could begin in the fall of 1984.

Facilitator Training Class Conducted for SW Region and Center Staff

Dr. and Mrs. Alexander Christakis conducted a course June 18-21, at the SWFC on how to facilitate meetings using the Interactive Structural Modeling (ISM) program. During the course Susan Iacometti assisted David Keever of Christakis and Associates, Ltd., in the transfer of the ISM programs to the UCSD VAX system from the University of Virginia host system.



Participants in the course (from left to right): Steve Reilly (La Jolla Laboratory); Sam Pooley (Honolulu Laboratory); George Boehlert (Honolulu Laboratory); Aleta Hohn (La Jolla Laboratory); Bruce MacFarlane (Tiburon Laboratory); Susan Iacometti (La Jolla Laboratory); Ron Shelten (SW Region); Jim Squire (La Jolla Laboratory); Dave Mackett (La Jolla Laboratory); Al Myrick (La Jolla Laboratory); and Alexander Christakis.

Priorities Determined for ADP Projects

On June 12 a meeting held to set priority levels for ADP projects was facilitated by David Mackett; he was assisted by Susan Iacometti. Participants were Izadore Barrett, John Carr, Reuben Lasker, Gary Sakagawa, John Hunter, and Ben Remington. Fred Kellenberger and Dorothy Roll provided information to the participants. Priorities were identified for the 11 major ADP projects.

An ad hoc ADP planning meeting, facilitated by Mackett, was held on June 29. This was the first two working sessions, chaired by Barrett and Carr. Participants were Kellenberger, Roll, Robert Nydam, Iacometti, Robert Bistodeau, and Mike Spruth from the ADP staff. Providing information on the project specifications were Andy Dizon and Wes Parks from OFRD and Ron Lynn and Dan Huppert, CFRD. Projects reviewed during the session included Word Processing on the La Jolla Molecular System, the Shipboard Molecular System, the Pacific Fishery Information Network (PACFIN) System, and Word Processing on the La Jolla Standard Microsystem.

ADMINISTRATIVE ACTIVITIES

A-76 Review

On June 26 the Center received an updated Management Efficiency Study (MES) from Arthur Young and Company. This revised draft MES was forwarded at the request of the NOAA Contracts Office. The Center is currently reviewing this draft to determine if the contractor has provided the infomation and data, as specified in the task order, and if sufficient information is included to complete the MES, and to produce the Performance Work Statement, if required.

MISCELLANEOUS

NOAA Junior Fellows Selected

Each summer since 1972, one or more outstanding graduating high school students have been selected for the NOAA Junior Fellowship Program. The students selected work at one of the Southwest Fisheries Center's laboratories, where they gain valuable, practical experience in marine science research.

Pamela Wilson, PEG, Jr. Fellow, graduated from Santa Catalina School, Monterey, California. She will be the first Junior Fellow at PEG. Wilson's scholastic interests include physics and chemistry. She has received a scholarship offer from Georgetown University and another is pending from University of California, Berkeley. Her recreational interests are in music (woodwinds) and theater productions. She also studies ballet.

At PEG, Wilson is working with Dick Parrish and Donna Mallicoate entering data for year class data base update. She is learning FORTRAN and writing a program for computation of catch/effort of albacore at different longitudes. She is also entering oceanographic data into a computer file for comparison of El Nino related factors in the Atlantic and Pacific Oceans.

Mwenda Kudumu was selected NOAA Junior Fellow for the La Jolla Laboratory. Kudumu graduated ninth in her class from Samuel Gompers Secondary School. In high school she was recognized for her outstanding science projects on the local, state and national level. She has worked as a lab technician in the biochemistry laboratory at the University of California San Diego, and the immunology laboratory at Scripps Clinic. Kudumu will attend Stanford University in the fall where she will study biology.

At the Center, she is working with Dr. Andrew Dizon, and Dr. Sarka Lucas (Scripps Institution of Oceanography) on mitochondrial DNA (mtDNA) project, to clone mtDNA from the tissues of the common dolphin, Delphinus delphis, and Commerson's dolphin, Cephalorhynchus commersonii.

Oceanic Division Employees Presented "Awards" at Informal Ceremony

Gilded plaster casts of sperm whale teeth, with accompanying "Tooth Fairy" certificates and the "Bird Scourge Award" were among the "awards" presented to 50 members of the Oceanic Fisheries Resources Division during an informal evening ceremony on the Scripps Institution of Oceanography campus on June 8. The awards presented were designed for the occasion by supervisors in the Oceanic Division to recognize the unique contributions of each individual to the accomplishment of the Division's research mission.

Honors and Awards

Honolulu Laboratory

The following employees received performance awards from Dr. Joseph Angelovic at a general staff meeting on June 28:

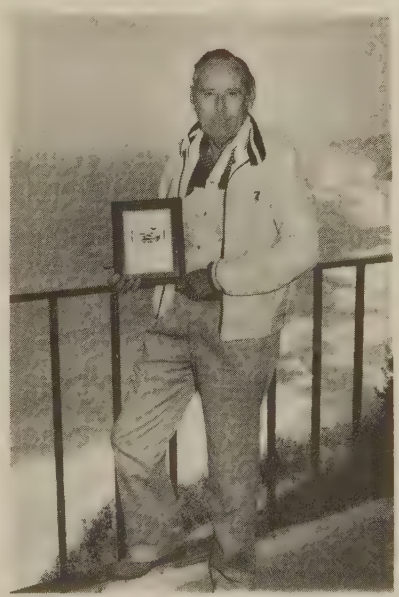
Joseph T. Arakawa	- Sustained Superior Performance
George H. Balazs	- Special Act
David C. Hamm	- Quality Step Increase
Gary L. Kamer	- Sustained Superior Performance
Todd T. Kassman	- Outstanding Performance Rating
Robert B. Miffitt	- Sustained Superior Performance
Tamoatsu Nakata	- Sustained Superior Performance
Dorothy D. Powell	- Outstanding Performance Rating
Stephen Ralston	- Sustained Superior Performance
Fletcher V. Riggs	- Quality Step Increase
Happy A. Williams	- Sustained Superior Performance

The following employees, whose awards have been approved but not received yet, were also recognized:

Samuel G. Pooley	- Sustained Superior Performance
James E. Tharpe	- Special Act

La Jolla Laboratory

On June 15, 1984, the National Coalition for Marine Conservation presented James Squire with an award in recognition of his continued support and promotion of marine conservation. The Coalition also established a perpetual plaque in honor of James Squire. The plaque will be awarded annually to the fishing boat Captain whose anglers tag the most billfish in a given year.



Public Affairs

Tiburon Laboratory

During June, Susan Smith, Fishery Biologist with the Tiburon Laboratory taught a one-unit course at San Francisco State University's Paul F. Romberg Tiburon Center for Environmental Studies. The five-day summer session course was entitled "Fisheries of San Francisco Bay" and covered sport and commercial fishing within the Bay--historical fisheries, fishing methods, current fisheries, and identification of local fishes.

Seminars

La Jolla Laboratory

June 8 - Dr. Jerry Powell, Executive Secretary of the Convention for the Conservation of Antarctic Marine Living Resources, presented a seminar "The convention for the conservation of Antarctic marine living resources versus the Antarctic Ocean."

12 - Dr. Frances Clark, the former Director of the Marine Division of the Department of Fish and Game, State of California, presented "Contributions of women to marine fisheries research."

28 - Alan Boyd, Sea Fisheries Institute, Cape Town, South Africa, gave a seminar "Upwelling and Advection off Southwest Africa."

Pacific Environmental Group

June 7 - Dr. James Simpson, Marine Life Research Group, Scripps Institution of Oceanography, presented a seminar on the "California El Nino."

22 - Alan Boyd, Sea Fisheries Institute, Capetown, South Africa, presented a seminar entitled "Upwelling and Advection off Southwest Africa."

Visitors

Honolulu Laboratory

June 25 - Ilene Byron of the National Weather Service met with Richard Shomura and Richard Uchida for a briefing on the goals, missions, and organizational structure of the Honolulu Laboratory.

28 - Dr. John Hampton of the Commonwealth Science and Industrial Research Organization, Australia, visited Dr. Jerry Wetherall.

29 - Dr. Guillermo Gomez-Sanchez from the Mexican Ministry for Fisheries, Mexico City, Mexico, visited Richard Uchida, Dr. Skillman, and Dr. Wetherall to discuss Hawaiian and western Pacific tuna fisheries and research.

La Jolla Laboratory

June 1 - Robin Rackowe, President of International Marine Fisheries Company, Miami, Florida, visited the Center.

6 - Mr. Andre van der Westhuysen, Manager of Marine and Earth Sciences of the Cooperative Scientific Programmes, Council for Scientific and Industrial Research, South Africa, visited John Hunter to discuss the CalCOFI program and participation in IREP.

13-21 - Dr. Alexander Christakis and Mrs. Margie Christakis, Christakis and Associates, conducted a facilitator training class at the Center.

25-26 - Dr. William Fox, Director, Cooperative Institute for Marine and Atmospheric Studies, University of Miami, Miami, Florida, visited Oceanic Fisheries Resources Division staff.

29 - Dr. Dennis Hedgecock, UC Bodega Marine Laboratory, visited the Center to discuss his research on population structure of the northern anchovy.

Pacific Environmental Group

June 1 - Craig Barilotti, Kelco Corporation, San Diego, California, discussed with Dr. McLain the use of data on isotherm depth to monitor effects of El Niño on kelp production off Southern California.

5 - Dr. Izadore Barrett, SWFC Director, conducted annual PEG Task Review. The review was also attended by John Carr and Dave Mackett of SWFC and by Dave Rand and Bob Wolf of NMFS Headquarters.

6 - Dr. Warren Wooster of University of Washington Institute for Marine Studies discussed data requirements and data availability regarding recruitment studies of Bering Sea and Gulf of Alaska fish stocks.

7 - Dr. James Simpson of Marine Life Research Group of Scripps Institution of Oceanography discussed mechanisms involved in the recent El Nino effects in the California Current.

19-20 - Dr. Douglas Butterworth, Mathematics Department, University of Capetown, and the International Whaling Commission, discussed recruitment research and fishery management modeling.

Tiburon Laboratory

5 - Angela Cincotta of Dominican College, San Rafael, met with Ed Ueber to discuss structural changes in fisheries due to the Magnuson Fishery Conservation and Management Act.

8 - Frank Henry of California Fish and Game, Menlo Park, California, met with Norm Abramson and Ed Ueber to discuss methods to increase logbook compliance among trawl fishermen.

22 - Sam Pooley of the Southwest Center, Honolulu Laboratory, and consultant Phil Meyers met with Ed Ueber to discuss methods of sampling recreational fisheries.

26 - Paul Wild of California Fish and Game, Monterey, California, met with Norm Abramson and Ed Ueber to outline and discuss new gillnet regulations.

Meetings and Travel

Honolulu Laboratory

June 2 - Dr. George Boehlert returned after a month-long visit to Hokodate and Shikabe, Hokkaido, Japan. Boehlert presented a seminar, "Reproduction and the maternal-fetal relationship in the viviparous genus Sebastes," at the Ocean Research Institute, University of Tokyo, while in Japan.

5-6 - A planning meeting on tuna research was held in the Honolulu Laboratory conference room. La Jolla Laboratory participants included Dr. Gary Sakagawa, Dr. Pierre Kleiber, and Dr. Norman Bartoo. Honolulu Laboratory participants were Richard Shomura, Richard Uchida, Dr. Robert Skillman, Dr. Jerry Wetherall, Walter M. Matsumoto, Dr. Jeffrey Polovina, Dr. Richard Brill,

Samuel Pooley, and Howard O. Yoshida. Skillman was facilitator for the meeting.

11-15 - Dr. Skillman represented Richard Shomura at the Council's SSC meeting, the Fishery Coordinating Council meeting, and the Council meeting at the Intercontinental Hotel, Wailea, Maui.

14-22 - Dr. Boehlert visited the Pacific Environmental Group, Monterey, California, where he presented a seminar, "A summary of the fishery and of planned research for the southern Emperor-northern Hawaiian Ridge seamounts." He also visited the La Jolla Laboratory.

17-22 - Richard Shomura traveled to Noumea, New Caledonia, to attend the South Pacific Commission tuna meeting.

26-27 - The Honolulu Laboratory program review was held in the conference room. Dr. Izadore Barrett, John F. Carr, and David Mackett from the SWFC, and Dr. Joseph Angelovic and Dr. Dean Parsons from Washington, DC, were present for the review.

29 - Richard Uchida represented Richard Shomura at a meeting of the Hawaii Fisheries Coordinating Council at the Department of Land and Natural Resources boardroom.

La Jolla Laboratory

June 2-7 - Gary Sakagawa attended a tuna research planning meeting in Honolulu, Hawaii.

3-6 - Dan Huppert traveled to Seattle, Washington, to attend a Groundfish Adaptive Environmental Assessment and Management Workshop.

3-8 - Rennie Holt visited Miami, Florida, to attend the Second SEFC Stock Assessment Workshop.

4-7 - Izadore Barrett, John Carr, and Dave Mackett traveled to Monterey and Tiburon, California, to attend FY 1984 and 1985 PEG and Tiburon Laboratory Program reviews.

- Pierre Kleiber and Norm Bartoo traveled to Honolulu, Hawaii, to attend a research planning meeting.

5-8 - Fred Kellenberger traveled to Seattle, Washington, to attend a National Data Management Committee meeting and to Los Angeles to attend a California ADP Council meeting and to meet with Southwest Region and CF&G staff.

7-8 - Susan Iacometti went to Long Beach, California, to attend the Federal ADP Council of Southern California and Arizona annual spring meeting.

10-16 - Tim Smith traveled to Woods Hole, Massachusetts, to participate in a data working group for Antarctic research, and to Davis, California, to present a paper at the Pacific Coast Resource Modeling Conference.

13-14 - Oceanic Fisheries Resources Division Task Reviews were held at the Center.

13-16 - Rick Methot presented results of a new population model at the Pacific Coast Resource Modeling Conference in Davis.

14-18 - Jim Gilpatrick and Jeannie Wexler traveled to San Clemente Island, California, to obtain counts, scats, tag resightings and salvage of sea lions and seals.

17-22 - Fred Kellenberger traveled to Las Vegas, Nevada, to attend a User Coordination Function Course.

17-23 - Ginny Hostler worked with Personnel Division staffing specialists, in Seattle, Washington, to improve the recruitment process and to establish standard operating procedures.

19-21 - Coastal Fisheries Resoures Division Task Reviews were held at the Center.

23-30 - Doug DeMaster traveled to Arcata, California, to attend the American Society of Mammalogists meeting and participate in the Marine Mammal Sub-committee Workshop, and to Seattle, Washington, to attend an optimum sustainable population workshop.

24-28 - Sandy Hawes and Larry Hansen traveled to Arcata, California, to attend the American Society of Mammalogists meeting and participate in the Marine Mammal Sub-committee Workshop.

25-28 - Izadore Barrett, John Carr and Dave Mackett traveled to Honolulu, Hawaii, for Honolulu Laboratory program reviews.

26-29 - James Squire traveled to Cabo San Lucas and Mazatlan, Mexico, to contact major tagging locations, distribute tags, make Gardiner Foundation Awards and discuss development of Billfish Workshop.

Pacific Environmental Group

June 21-30 - Lt. (jg) Russell Brainard participated in a cruise sponsored by the Naval Postgraduate School Oceanography Department on the U.S. Navy research vessel DeSteiger.

Tiburon Laboratory

June 10-14 - Bill Leet, Sennen Salapare, Sus Kato and Ed Ueber met with personnel of the Fishery Development Division of the Southwest Region at Terminal Island, California. Leet, Salapare and Kato also collected samples of mackerel in San Pedro, California, and helped process them for a continuing study of flesh characteristics being conducted at a fish-cake manufacturing plant in Los Angeles, California.

14-15 - Ed Ueber attended a meeting of Southwest Region and Southwest Fisheries Center economists in La Jolla, California.

26-27 - Bill Leet traveled to Fort Bragg, and Eureka, California, to loan the Furuno Netsonde, crab traps and shrimp pots to fishermen.

Press Release

Honolulu Laboratory

June 14 - "Tagged Striped Marlin Recaptured Near Hawaii."

Training

Honolulu Laboratory

June 13-21 - Dr. George Boehlert and Samuel G. Pooley attended the facilitator training course presented by Dr. Alexander Christakis of the Center for Interactive Management, University of Virginia, at the La Jolla Laboratory.

Tiburon Laboratory

June 18-21 - R. Bruce MacFarlane, Oceanographer, attended the facilitator training course at the Southwest Fisheries Center, La Jolla Laboratory.

Personnel

Honolulu Laboratory

June 1 - George H. Balazs, Wildlife Biologist - Extension of Temporary Appointment.

10 - Victor A. Honda, Biological Technician (Fisheries) - Promotion.

- Todd T. Kassman, Computer Programmer - Conversion to Excepted Appointment.

- Bert S. Kikkawa, Biological Technician (Fisheries) - Promotion.

14 - John A. Loux, Biological Aid (Fisheries) - Extension of Temporary Appointment.

24 - Gordon S. Yamasaki, Fishery Biologist - Conversion to Reinstatement-Career.

29 - Richard N. Uchida, Supervisory Fishery Biologist (Research) - Detail to Chief, Pelagic Resources Investigation.

30 - Robert O. Mendelsohn, Industry Economist - Termination - Expiration of Appointment.

La Jolla Laboratory

June 11 - Patricia Wilkins, Clerk Typist - Entered on Duty.

15 - Huong Bui, Computer Clerk - Expiration of Appointment.

26 - Mwenda Kudumu, Biological Science Trainee - Entered on Duty.

29 - Lisa Ankenbrandt, Computer Assistant - Resignation.

Tiburon Laboratory

June 7 - Frank J. Jacques, Junior Fellow - Return to Duty.

29 - Cheyenne U. Summers, Clerk Typist - Resignation.

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